ISD and the Exploration Initiative

ECANS/C3I and LMS Support

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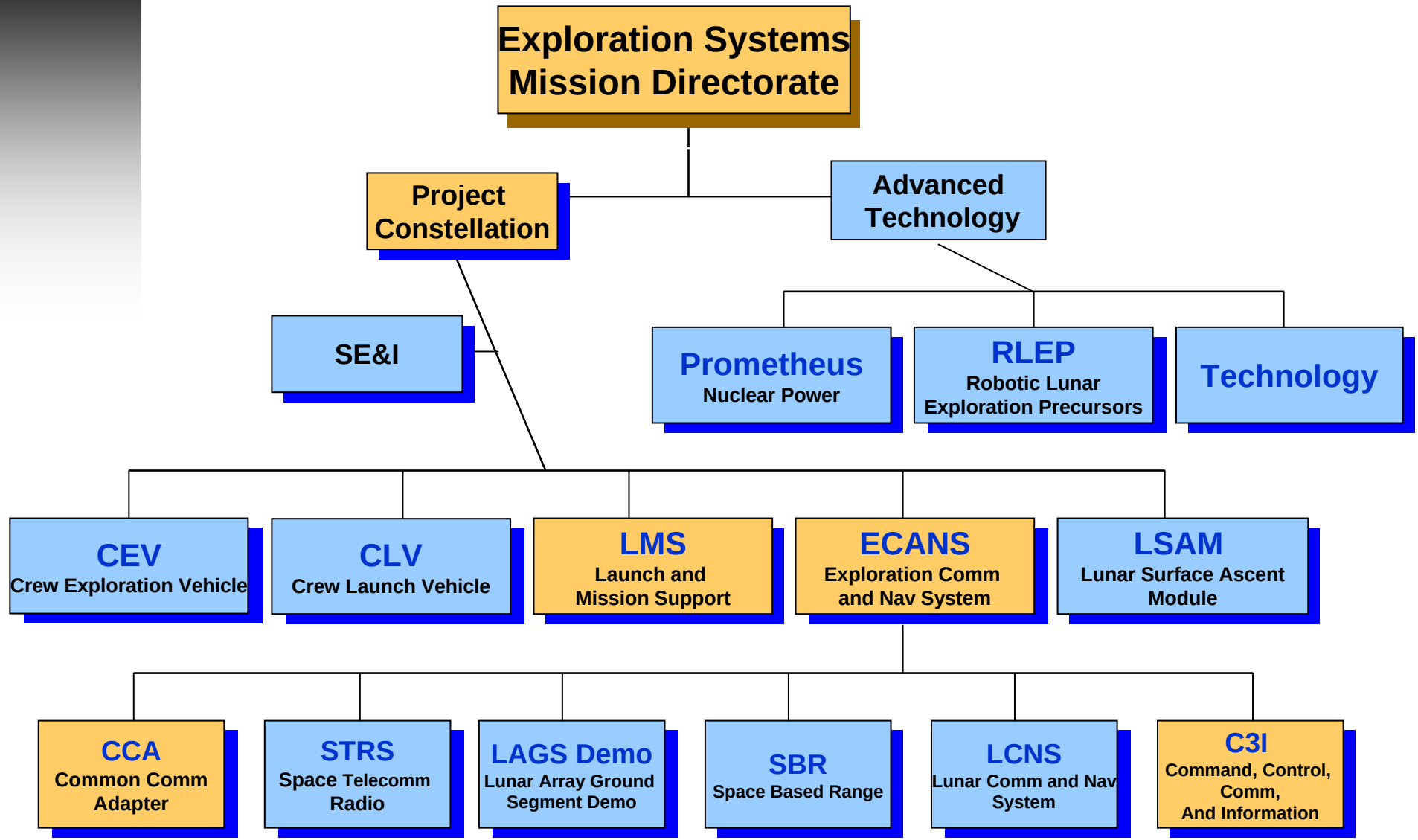
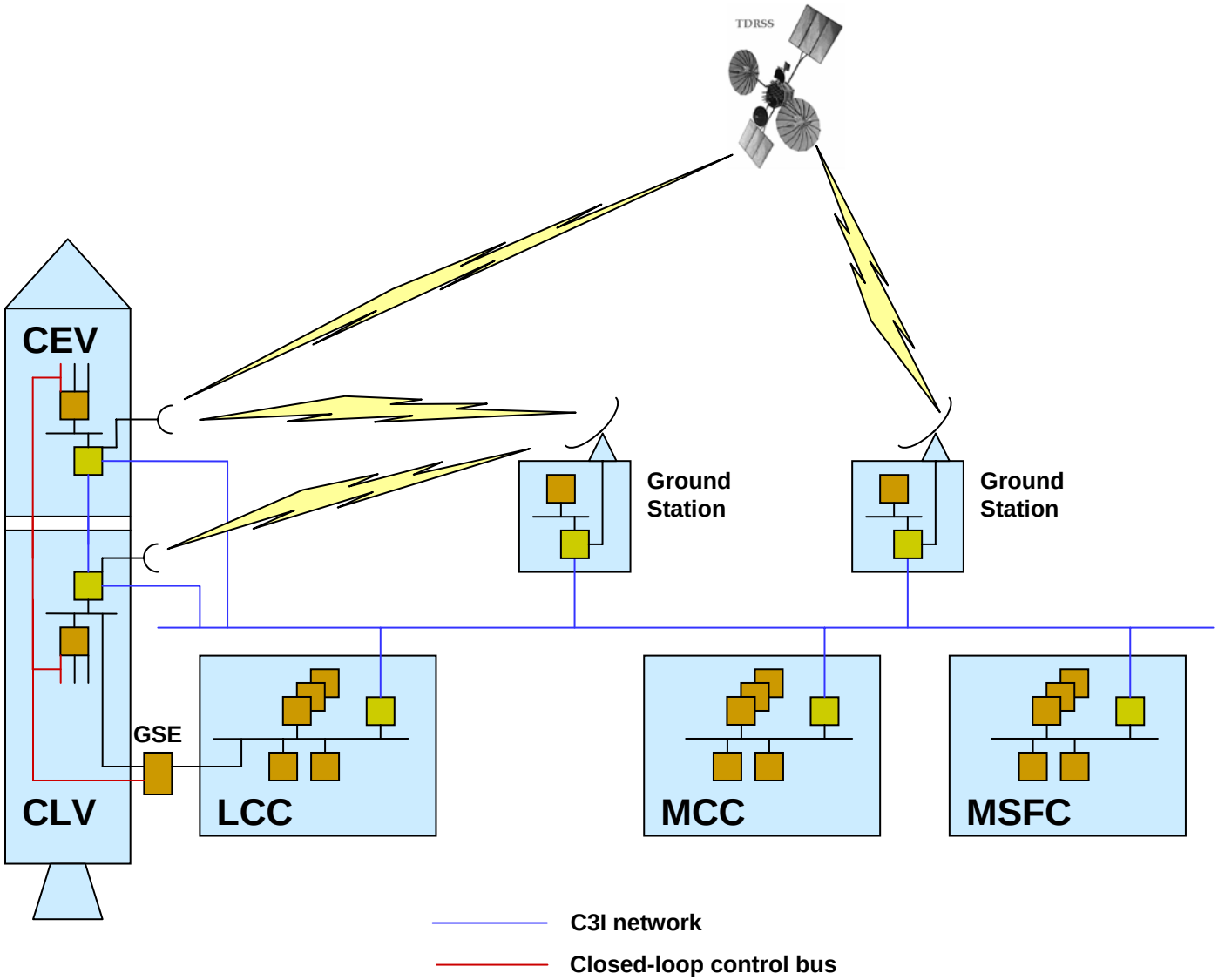
ESMD/Constellation Organization



C3I Overview

- Command, Control, Communications, and Information (C3I) Architecture task initiated in June, 2004
- Experienced engineers from multiple NASA Centers
- Key goal: "Concept definition and assessment of the best approach for pursuing an interoperable Command, Control, Communications, and Information architecture that spans across all elements of Constellation Systems…"
- Architecture drivers
  - Consistent element interoperability
  - Flexible multi-element control
  - Ability to evolve over time to adapt to increased elements and more advanced missions (i.e. Lunar or Martian outposts)

C3I Overview



Segments of Responsibility

- **ISD tasks fall within two elements of the Constellation Systems organization**
  - Exploration Communications and Navigations Systems (ECANS)
  - Launch and Mission Systems (LMS)
- **Four segments of responsibility within these elements**
  1. ECANS Architecture & Analysis / C3I Architecture and Studies
  2. ECANS / C3I Reference Implementation
  3. ECANS / C3I Communications Adapter (CCA)
  4. Launch and Mission Systems (LMS)
- **Need coordination between segments to help develop and validate requirements and specifications and assist with any required studies**
- **Anticipate coordination between ECANS and LMS to develop a common control center capability since many of the reference implementation concepts are common for flight and ground**

1. ECANS C3I Architecture and Studies

- **Systems Engineering effort focused on systems analysis, requirements definition, and trade studies**
- **Tasked to derive true, traceable requirements for the Exploration data systems, including communications and interoperability**
- **Basis will be the recent Exploration Architecture Study report and other high-level requirements from previous C3I specifications**
- **May bring in industry consultants in areas such as security and messaging systems to discuss the current state-of-the-practice and the industry's direction**

JPL Lead: Thom McVittie
GSFC has 3 of 15 Total FTEs

2. ECANS C3I Reference Implementation

- **Multi-year reference architecture implementation effort**
  - Focused on how proposed technologies can be assembled to meet requirements
  - Will need to address changing requirements and analysis results that surface early in the program
- **Comprised of four teams**
  - Framework
    - Data exchange, information management, and security
    - Extension of the original GMSEC framework team
  - Components and Applications
    - Monitor, command, recording/playback, data transformation, voice/video, collaboration, planning/analysis, and operations support
  - Information Model
    - Data dictionary and methods to manage the consistent representation of information across elements
  - Integration and Testing
    - Examine and/or develop testing technologies required to certify new decoupled, asynchronous data systems

JSC Lead: Steve Rader
GSFC has 4.7 of 23 Total FTEs

3. ECANS C3I Communications Adapter (CCA)

- **Initially championed by Jason Soloff/561 and now led by Tom Jackson/582**
- **Involves the development of a software radio-based communications adapter**
- **Provides a variety of functions**
  - Gateway security
  - Routing
  - Interoperable communications
  - Autonomous crosslink establishment (proximity operations)
  - Demand access and QoS scheduling
  - Vehicle onboard network connectivity (vehicle docking connectivity)
- **Comprised of several services**
  - Link manager
  - Contact scheduling
  - Relay support (store and forward)
  - Communication monitor and control
  - Hardware abstraction layer for RF system
  - Security

GSFC Lead: Tom Jackson (582)
GSFC has 10.5 of 18.75 Total FTEs

4. Launch and Mission Systems (LMS)

- **Analysis, prototyping, design and development of the actual systems to replace or upgrade today's launch and mission control centers**
- **Team will build on the Reference Architecture as well as Analysis and Requirements work to move towards a specific set of implementations**
- **Tasks include domain analysis, framework, and applications**

KSC Lead: Larry Morgan
GSFC has 10 of 75 Total FTEs

Status/Summary

- ***Task leads are still working their initial plans – not quite ready for a full staff-up***
- ***Our best guess is we will continue to add people to the GSFC team with a goal of January for full staffing***
- ***This type of program comes with an expectation of initial instability and change***
  - *Many groups and Centers involved*
  - *Exploration organization at Headquarters continues to change*
  - *Tasks may appear to overlap or be inconsistent*
- ***We have the right people in ISD to perform most of the GSFC-assigned work. We need to staff up at a rate commensurate with the planning and progress being made at other Centers. Please have patience.***